Semester I
Course Name: Classical Mechanics
Course Code: PP2011

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objectives

1. To have in depth knowledge in classical mechanics.
2. To enable students to develop skills in formulating and solving physics problems.
3. To study the kinematics of the rigid body through Euler equation.
4. To get knowledge in central force field and relativity.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	understand the basic mechanical concepts related to single and system of particles.	PSO - 1	U
CO - 2	apply various mechanical principles to find solution for physical problems.	PSO - 4	Ap
CO - 3	solve the equations of motion using Lagrangian, Hamilton and Hamilton-Jacobi equations.	PSO - 6	C
CO - 4	explain the origin of coriolis and centrifugal terms in the equation of motion in a rotating frame.	PSO - 1	R
CO - 5	understand and develop a scientific knowledge in central force problems and relativity	PSO - 7	U

Teaching Plan

Total contact hours: 90 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Lagrangian Formulation					
	1	Lagrangian formulation: System of particles - Constraints and degrees of freedom-	4	To understand the basic concepts of system of particles and	Illustration, Theoretical formulation, Lecture discussion	Evaluation through:

		Generalized coordinates, Force and Energy		generalized coordinates		multiple choice questions Quiz, short questions Problem solving Formative assessment Deriving theoretical formulas Short test
	2	Conservation laws - Conservations of linear and angular momenta - Symmetric properties – Homogeneity and isotropy	4	To be able to understand the concept of conservation laws, homogeneity and isotropy	Theoretical formulation, Illustration, Lecture discussion	
	3	D'Alemberts principle of virtual work - Lagrange's equation of motion - non holonomic systems	3	To formulate Lagrange's equation of motion using D'Alembert's principle	Theoretical formulation, Illustration, Lecture discussion, PPT	
	4	velocity dependent potential - Dissipative force – Newtonian and Lagrangian Formalism	4	To understand the Newtonian and Lagrangian formalism	Illustration, Theoretical formulation, Lecture discussion	
II	Hamilton's Equation and Canonical Transformation					
	1	Calculus of variation - Principle of least action - Hamilton's principle - Hamilton`s function	4	To formulate Hamilton's function using Hamilton's principle	Illustration, PPT, theoretical formulation	Evaluation through: multiple choice questions Quiz, short questions
	2	Lagrange's equation from Hamilton's principle - Hamilton's	3	To derive Lagrange's equation from	Illustration, PPT, theoretical formulation	

		principle for non holonomic system		Hamilton's principle		Problem solving Formative assessment Deriving theoretical formulas Short test
	3	Variational principle - Hamilton's equations from variational principle - Legendre transformation and Hamilton's equation of motion	4	To understand the concept of variational principle and derive Hamilton's equation from variational principle	Lecture discussion, Illustration, PPT, theoretical formulation	
	4	Canonical transformations- Hamilton's canonical equations - Generating functions- Examples - Poisson brackets and its properties.	4	To understand the concept of canonical transformation and poisson bracket	Illustration, Lecture discussion, theoretical formulation	
III	**Hamilton-Jacobi Theory and Small Oscillations**					
	1	Hamilton-Jacobi equation for Hamilton's principal function - Example: Harmonic oscillator problem	4	To derive the Hamilton-Jacobi equation for Hamilton's principal function and to solve the Harmonic oscillator problem.	Illustration, theoretical formulation, Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions
	2	Hamilton's characteristic function -	3	To formulate the Hamilton's	Illustration, PPT, theoretical formulation	

		Action - Angle variable		characteristic function and explain the Action - Angle variable		Problem solving
	3	Application to Kepler problem in action angle variables. Eigen value equation	4	To analyze the application to Kepler problem in action angle variables; To solve Eigen value equation.	Illustration, theoretical formulation , Lecture discussion	Formative assessment
	4	Normal coordinates - Normal frequencies of vibration – Free Vibrations of linear tri atomic molecule.	4	To discuss the Normal coordinates and Normal frequencies of vibration and to derive the normal frequencies of free vibrations of linear tri atomic molecule.	Illustration, PPT, theoretical formulation	Deriving theoretical formulas Short test
IV	**Kinematics of Rigid Body**					
	1	Independent coordinates of rigid body - Orthogonal transformation - Properties of transformation matrix	4	To understand the concept of Independent coordinates of rigid body. To derive the Orthogonal transformation and Properties of transformation matrix	Illustration, theoretical formulation , Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions
	2	Euler angle and Euler's theorem - Infinitesimal	3	To derive Euler angle and Euler's theorem. To	Illustration, PPT, theoretical formulation	Problem solving

		rotation - Coriolis force		understand the concept of Infinitesimal rotation and Coriolis force.		Formative assessment Deriving theoretical formulas Short test
	3	Angular momentum and kinetic energy of motion about a point - Moment of inertia tensor - Euler's equations of motion	4	To derive the relation between the angular momentum and kinetic energy of motion about a point. To derive the Moment of inertia tensor and Euler's equations of motion.	Illustration, theoretical formulation, Lecture discussion	
	4	Force free motion of a symmetrical top - Heavy symmetrical top with one point fixed	4	To analyze the torque free motion of a symmetrical top and to discuss the heavy symmetrical top with one point fixed.	Illustration, PPT, theoretical formulation	
V	**Central Force Problem and Theory of Relativity**					
	1	Reduction to the equivalent one body problem- Centre of mass- Equation of motion and first integral- classification of orbits	3	To derive the reduced mass of the equivalent one body problem. To understand the concept of Centre of mass, Equation of motion and first integral. To discuss	Illustration, theoretical formulation, Lecture discussion	Evaluation through: multiple choice questions Quiz, short questions

				the classification of orbits based on the eccentricity.		Problem solving
	2	Kepler problem: Inverse-Square law of force - Scattering in a central force field - Transformation of scattering to laboratory coordinates.	4	To derive the Kepler problem: Inverse-Square law of force. To understand the concept of Scattering in a central force field. To transfer the scattering to laboratory coordinates.	Illustration, theoretical formulation, Lecture discussion	Formative assessment Deriving theoretical formulas
	3	Virial theorem – Lorentz transformation - Relativistic Mechanics - Relativistic Lagrangian and Hamiltonian for a particle	4	To understand the Virial theorem. To derive the Lorentz transformation. To understand the concepts of Relativistic Mechanics and to derive the Relativistic Lagrangian and Hamiltonian for a particle.	Illustration, PPT, theoretical formulation, Lecture discussion	Short test
	4	Mass in Relativity - Mass and energy – Space-time diagram – Momentum vectors	4	To understand the concept of mass in relativity. To discuss the relation between	Illustration, PPT, theoretical formulation, Lecture discussion	

				Mass and energy; To analyze Space-time diagram and to derive the Momentum vectors.		

CO- Course Outcome; CL-Cognitive Level; R- Remember; U- Understand; Ap- Apply; C - Create.

Course Instructors: Dr.M.Priya Dharshini and Ms.S.Virgin Jeba

Semester I

Course Name: Mathematical Physics
Course Code: PP2012

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objectives

1. To emphasize the use of mathematical tools like evaluation of definite integrals in the field of classical and quantum mechanics.

2. To demonstrate competence with a wide variety of mathematical techniques to enhance problem solving skills.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	apply the various theorems in complex analysis to evaluate definite integrals.	PSO - 4	E
CO - 2	determine the series solutions and the recurrence relations (Bessel, Legendre and Hermite differential equations) and solve problems associated with them.	PSO - 3	E
CO - 3	discuss the basic principles and methods used for the analysis of partial differential equations and apply the techniques to related problems.	PSO - 4	C
CO - 4	discuss the concepts of Fourier, Laplace and inverse Laplace transform, tensors, group theory and their properties.	PSO - 5	C
CO - 5	develop expertise in mathematical techniques required in physics and to enhance problem solving skills.	PSO - 6	An

Modules

Credit:4 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Modules	Topics	Lecture hours	Learning outcome	Pedagogy	Assesment /Evaluation
I	**Complex Analysis**					
	1	Functions of Complex variable- Analytic functions – Cauchy – Riemann equations in cartesian and polar forms – Harmonic functions - Cauchy's integral theorem	4	To be able to identify the analytic functions by using the Cauchy's Riemann equations	PPT, Theoretical formulation and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Cauchy's integral formula – Taylor's Series – Laurent series	3	To be able to evaluate the integrals using Cauchy's formula and able to apply the series in computational science and approximation	Analysis and Problem solving	
	3	Cauchy's residue theorem – Singular points of an Analytic function – Evaluation ofresidues - application to evaluation of definite integrals –	4	To be able to apply the Cauchy's Residue theorem to evaluate the definite integrals of analytic functions	Analysis and Problem solving	
	4	Integration around a unit circle –Jordan's Lemma.	3	To be able to apply the Jordan's lemma to evaluate contour integrals	Analysis and Problem solving	
II	**Polynomials**					
	1	Legendre differential equation and Legendre functions – Generating functions	4	To acquire basic understanding of the partial differential equations and learn some	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom

				methods for solving them.		Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Rodrigue’s formula – Orthogonal Properties - recurrence formula	3	To accomplish operations with differential equations along with the recurrence formulae	Analysis and Problem solving	
	3	Bessel differential equation – Bessel functions of I kind - recurrence formula and generating functions	4	To execute operations with Bessel differential equations	Analysis, Problem solving and comparative study	
	4	Hermite differential equations and Hermite polynomials - Generating functions & recurrence formula.	3	To carry out operations with Hermite differential equations along with the recurrence formulae	Analysis, Problem solving and comparative study	
III	**Differential and Partial Differential equations**					
	1	Homogeneous linear equations of second order with constant coefficients and their solutions	3	To be able to solve second order Homogenous differential equations	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Ordinary second order differential with variable coefficients and their solution by power series and Frobenius methods	4	To be able to apply the power series and Frobenius methods to evaluate the solution of second order differential equations	Analysis and Problem solving	
	3	Solution of Laplace equation in Cartesian coordinates- Solution of heat flow equations	3	To be able to solve boundary value problems occur in steady state temperatures and of hydrodynamics	Analysis and Problem solving	
	4	Method of separation of variables – variable linear flow – One and two dimensional heat flow.	4	To be able to solve problems for heat flow	Analysis and Problem solving	

				equations in different dimensions under certain boundary conditions		
IV	**Tensors, Fourier and Laplace transforms**					
	1	Contravarient and Covarient Tensors - Addition and Subtraction – Outer product - inner product of tensors	3	To be able to solve mathematical problems involving tensors	Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving Short questions Descriptive answers Formative assessment
	2	Contraction of a tensor - Symmetric and anti-symmetric tensors – The Kronecker delta	3	To be equipped to use tensor algebra as a tool in the field of applied sciences	Analysis and Problem solving	
	3	Fourier transform- properties of Fourier transform - Fourier transform of a derivative	4	To be able to understand and apply the concept of Fourier transform to waveforms and spectra.	Analysis and Problem solving	
	4	Laplace transform- properties of Laplace transform- Inverse Laplace Transform.	4	To be able to use the Laplace transform equations for solving boundary value problems by directly changing the ordinary differential equations into algebraic equations.	Analysis and Problem solving	
V	**Group theory**					
	1	Group postulates – Abelian group – Cyclic group – Group multiplication table – Rearrangement theorem – Subgroups	3	To understand the mathematics of group theory	Descriptive lecture, Analysis and Problem solving	Evaluation through: Online quiz, through Google Classroom Assignments on Problem solving
	2	Isomorphism and Homomorphism – Symmetry elements and symmetry operations	4	To understand the symmetry and point group of molecules	Descriptive lecture, Analysis and Problem solving	

	3	Reducible and irreducible representations	3	To generate a representation and to reduce it to its irreducible representation	Descriptive lecture Analysis and Problem solving	Short questions Descriptive answers Formative assessment
	4	The great orthogonality theorem - Character table for C_{2V}& C_{3V} point groups.	4	To determine the irreducibility of a reducible representation	Descriptive lecture Analysis and Problem solving	

PO- Program outcome; LO – Learning outcome;
Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Semester: I

Course Name: QUANTUM MECHANICS -I
Course code: PP2013

No. of hours per week	No. of credits	Total No. of hours	Marks
6	5	90	100

Objective

To help the students to acquire understanding of the fundamental concepts and mathematical tools necessary to solve the wave equations.

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	summarize the concept of wave function and the postulates of quantum mechanics.	PSO-1	U
CO - 2	formulate time dependent and time independent equation and solve them for simple potentials.	PSO-4	C
CO - 3	evaluate the eigen values and eigen function spin and total angular momenta and determine the matrices.	PSO-4	E
CO - 4	analyze the principles of quantum theory, equation of motion, scattering theory and angular momentum.	PSO-4	An

Modules

Credit:5 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Foundations of Wave Mechanics					

		Wave packet – Time dependent Schrödinger equation – Interpretation of the wave function	4	To understand basic concepts of quantum mechanics by deriving group velocity, phase velocity and time dependent Schrodinger equation	PPT, Illustration and theoretical derivation	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formativ e assessme nt
		Admissibility conditions on the wave function – Hermitian operator – Postulates of quantum mechanics	4	To be able tounderstand the wave function and postulates of quantum mechanics	Illustration, Theoretical formulation Problem Solving	
		Simultaneous measurability of observables – General uncertainty relation – Ehrenfest's theorem	4	To analyze observables and their properties	PPT, Theoretical formulation and Problem solving	
II	**Eigen States and Many Electron Atoms**					
	1	Square-well Potential with Rigid Walls- Square Potential Barrier –Alpha Emision- Time independent Schrodinger equation	3	To understand the basic concepts and features related to Square-well Potential	PPT Illustration, lecture, and Problem solving	Evaluation through: Online quiz, short questions Descriptive answers Problem solving Formative assessment
	2	Time dependent Schrödinger equation – Stationary states - Eigen functions and eigen values	3	To relate time independent and time dependent Schrodinger equation	Descriptive lecturecompara tive study	
	3	Kronig Penny square well periodic potential- Indistinguishable Particles- Particle Exchange Operator	3	Toformulate Kronig Penny square well periodic potential and operators	PPT, Theoretical formulation and Problem solving	

	4	Symmetric and Antisymmetric Wave Functions - Pauli Principle – Inclusion of spin	3	To understand Symmetric and Antisymmetric Wave Functions	Illustration, Theoretical formulation and Problem solving	
III	**Exactly Soluble Eigen value Problems**					
	1	One dimensional linear harmonic oscillator – operator method - Particle moving in a spherically symmetric potential	3	To solve the one-dimensional linear harmonic oscillator problem	Illustration, Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descriptive answers Assignment on applications Formative assessment
	2	Spherical harmonics- Radial equation- Rigid rotator- Hydrogen atom- solution of the radial equation	2	To formulate radial equations of hydrogen atom	PPT, Illustration,Theoretical formulation and Problem solving	
	3	Energy eigen values- Radial wave functions- Wave functions of hydrogen-like atom	3	To understand the eigen values and wave functions	Illustration, Theoretical formulation and Problem solving	
	4	Radial Probability density- Three-Dimensional square-well potential.	4	To formulate three-Dimensional square-well potential.	Illustration, Theoretical formulation comparative study and Problem solving	
IV	**Matrix Formulation of Quantum Theory, Equation of Motion & Angular Momentum**					
	1	Linear vector space- Dirac's notation-Equation of motions	2	To derive equation of motion using Quantum mechanical concepts	Theoretical formulation	Evaluation through: Online quiz, short questions Descriptive answers Problem solving Formative assessment
	2	Schrodinger, Heisenberg and Interaction representation.	2	To compare representation of equation of motion	Theoretical formulation	
	3	Angular momentum operators – Angular momentum commutation relations – Eigen values and eigen functions of L^2 and L_z	2	To understand the basic concepts and features related to Angular momentum	PPT Illustration, lecture, and Problem solving	

	4	General angular momentum – Eigen values of J^2 and J_z	2	To relate angular momentum and general angular momentum	Descriptive lecture comparative study	
	5	Angular momentum matrices – Spin angular momentum – Spin vectors for spin-(1/2) System	2	To formulate angular momentum matrices	Theoretical formulation and Problem solving	
	6	Addition of angular momentum: Clebsch-Gordon coeffiecients	2	To obtain C-G coefficient from angular momentum	Illustration,Theoretical formulation and Problem solving	
	7	Stern Gerlach Experiment.	1	To prove concept of spin experimentally	Demonstration	
V	**Scattering theory**					
	1	Scattering cross-section – Scattering amplitude	1	To understand the basic concepts and features related to scattering	PPT Illustration, And Descriptive lecture	Evaluation through: Online quiz, short questions Descriptive answers Problem Solving Formative assessment
	2	Partial waves – Scattering by a central potential: Asymptotic solution.	3	To understand the concept of partial waves	Descriptive lecture and Theoretical formulation	
	3	Optical theorem- Ramsauer-Townsend effect- Partial wave analysis	2	To apply the concept of partial waves	Descriptive lecture and Theoretical formulation	
	4	Scattering by an attractive square-well potential – Breit-Wigner Formula - Scattering length - Expression for phase shifts - Integral equation	3	To apply scattering theory to physical problems	Descriptive lecture and Theoretical formulation	
	5	The Born approximation – Scattering by screened coulomb potential – validity of Born approximation	2	To understand Born approximation	Descriptive lecture and Theoretical formulation	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Staff –in –charge :Ms.Sonia & Ms.Aji Udhaya

Semester I

Course code: Numerical Methods

Course code: PP2016

No. of hours per week	No. of credits	Total No. of hours	Marks
6	4	90	100

Objective

To understand various numerical methods used to solve the physical problems.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	understand the various interpolation methods and finite difference concepts	PSO - 1	U
CO- 2	analyze the numerical solutions of linear and non linear equations	PSO - 4	An
CO- 3	utilize various numerical methods for differentiation and integration	PSO - 4	Ap
CO -4	discuss the concepts of ordinary differential equations	PSO - 5	C

Modules

Credit:4 **Total Hours:90 (Incl. Seminar& Test)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
I	**Interpolation**					
	1.	Introduction, Polynomial Forms, Linear interpolation.	4	To understand the basic concepts of interpolation	PPT, Illustration and theoretical derivation	Evaluation through: Online quiz, Problem solving short
	2.	Lagrange Interpolation Polynomial, Newton Interpolation Polynomial	4	To be able to solve the problems of Lagrange and Newton Interpolation	Illustration, Theoretical formulation Problem Solving	

	3.	Divided difference table, Interpolation with equidistance points, Spline interpolation	4	To solve the problems of Divided difference table, Interpolation with equidistance points, Spline interpolation	PPT, Theoretical formulation and Problem solving	questions Descriptive answers Formative assessment
II	**Roots Of Nonlinear Equations**					
	1	**15 Hours** Introduction, Methods of Solution, Iterative Methods, Starting and Stopping an Iterative Process, evaluation of Polynomials	3	To understand the basic concepts of Iterative Methods	PPT Illustration, lecture, and Problem solving	Evaluation through: Online quiz, short questions Descriptive answers Problem solving Formative assessment
	2	Bisection method, False Position Method, Newton- Raphson Method	3	To solve various methods like Bisection, False Position and Newton-Raphson Method	Descriptive lecture solving problems	
	3	Secant Method, Fixed Point Method	3	To find the roots using Secant and Fixed Point Method	PPT, Theoretical formulation and Problem solving	
	4	Determining All Possible Roots.	3	To determine all Possible roots for the Polynomial equation	Illustration, Theoretical formulation and Problem solving	
III	**Solutions of Linear Equations**					

	1	**15 Hours** Need and Scope, Existence of Solutions, Solution by Elimination,	3	To understand the basics of elimination method	Illustration, Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descripti v e answers Assignme n t on applicatio ns Formative assessmen t
	2	Basic Gauss Elimination Method, Gauss Elimination with Pivoting, Gauss- Jordan Method	2	To solve the problems of Gauss Elimination, Gauss Elimination with Pivoting and Gauss- Jordan Method	PPT, Illustration, Theoretical formulation and Problem solving	
	3	Triangular Factorization Methods, Round-off Errors and Refinement, Ill- Conditioned Systems,	3	To understand the Triangular Factorization Methods and Round-off Errors	Illustration, Theoretical formulation and Problem solving	
	4	Matrix Inversion Method, Jacobi Iteration Method, Gauss Seidel Method.	4	To solve the problems of Matrix Inversion Method, Jacobi Iteration Method and Gauss Seidel Method.	Illustration, Theoretical formulation comparative study and Problem solving	
IV	**Numerical Differentiation and Integration**					
	1	Numerical Differentiaton: Need and Scope, differentiatig continuous functions,	4	To understand the basic concepts of Numerical Differentiation	Theoretical formulation and Problem solving	Evaluation through: Online quiz, short questions Descripti v e answers Problem solving
	2	Differentiating tabulated functions, Difference tables, Numerical Integration.	4	To solve problems for Difference tables and study the basics of Numerical Integration.	Theoretical formulation and Problem solving	

	3	Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Higher Order Rules.	4	To solve problems using Trapezoidal Rule, Simpson's 1/3 Rule and Simpson's 3/8 Rule	PPT Illustration, lecture, and Problem solving	Formative assessmen t
V	**Numerical Solutions of Ordinary Differential Equations**					
	1	**15 Hours** Need and Scope, Tailor Series Method – Improving accuracy,	3	To understand the basic concepts and features of Tailor Series	PPT Illustration, And problem solving	Evaluation through: Online quiz,
	2	Picard's method, Euler's Method – accuracy of Euler's method, .	3	To solve differential Equations using Picard's, Euler's Method , Euler's method,	problem solving	short questions Descripti v e answers
	3	Heun's Method – Error analysis, Polygon Method,	3	To apply the concept of Heun's Method , Error analysis, Polygon Method to solve the equations	PPT Illustration, And problem solving	Problem Solving
	4	Runge-Kutta Methods- Determination of weights, Fourth order Runge-Kutta methods.	3	To apply Runge-Kutta Methods to solve the problems	PPT Illustration, And problem solving	Formative assessmen t

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C-Create

Staff-in charge: Ms.Shally & Ms.Lesly

Semester II

Course Name: Electromagnetic Theory

Course code: PP2021

No.of hours per week	No. of credits	Total No .of hours	Marks
6	4	90	100

Objectives

1. To provide knowledge on the propagation of electromagnetic radiation

2.To develop theoreticalknowledge,skillsonsolvinganalyticalproblemsinelectromagnetism.

CO	Upon completion of this course, students will be able to	PSO addressed	CL
CO -1	Summarize the fundamental laws of electrodynamics based On Maxwell's equations.	PSO-1	U
CO -2	Enumerate the concept of energy in electrostatic and Magnetostatic fields.	PSO-2	K
CO -3	Illustrate the electrical properties of materials; solve the Wave equation as plane waves in source.	PSO-5	Ap
CO -4	Analyze the wav epolarization and reflection/transmission of Plane waves in homogenous media.	PSO-4	An

Teaching Plan

Credits: 4 **Total Hours: 90 (Incl. Seminar &Test)**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	Electrostatics					
	1	Coulomb's law; the electric field – line, flux and Gauss's Law in differential form - theelectrostatic potential; conductors and insulators	4	Understand the concepts Electrostatic field and basicequations	PPT, Descriptive lecture	Evaluation through: quiz, Problem

	2	Gauss's law - application of Gauss's law –curl of E - Poisson's equation; Laplace's equation	3	To understand the divergence and curl of E and its applications	Illustration, Descriptive lecture	solving Descriptive answers
	3	work and energy in electrostatics – energy of a point charge distribution – energy of continuous charge distribution – inducedcharges – capacitors.	4	Understand the basic concept of energy of a point charge and continuous charge distribution	Videos, group discussion	short questions
	4	Potentials: Laplace equation in one dimension and two dimensions –Dielectrics – induceddipoles– Gauss'sLawinthepresence ofdielectrics.	4	Solve solution of Laplace's equation in one and two dimension and understand the electric fields conductors and dielectrics	Seminar, Lecture	Formative assessment (I CIA)
II	Magnetostatics					
	1	Lorentz force – magnetic fields – magnetic forces – currents – Biot-Savart Law – divergenceand curl of B	4	Understand the concept of magnetic fields, Biotsavart's law for a line current	PPT Illustration, Descriptive lecture	Evaluation through: quiz,
	2	Ampere's Law – Electromagnetic induction - comparison of magnetostaticsand electrostatics –	4	To acquire knowledge on ampere's law and magnetic vector potential	Lecture ,Videos	short questions Descriptive answers
	3	Magnetic vector potential- Magnetization: effect of magnetic field onatomicorbit–	4	To understand the effect of magnetic field on atomic orbit	Descriptive lecture	Problem solving Formative assessment (I&II CIA)
	4	Ampere'sLawin magnetizedmaterials– ferromagnetism.	3	Understand the ampere's law in magnetized materials	Descriptive lecture, seminar	

III	ElectromotiveForce					
	1	Ohm's Law – electromotive force – motional emf – Faraday's Law –	4	Understand t	Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment (I CIA)
	2	induced electric field –inductance– energyinmagneticfield	3			
	3	Maxwell'sequationinfreespacean dlinearisotrophicmedia– continuityequation – Poyntingtheorem.	4	Solve the Maxwell's equations and pointing theorem	Descriptive lecture	
	4	Waves in one dimension – wave equation – sinusoidalwaves – reflectionandtransmission– Polarization.	4	Solve the wave equation. Reflection, transmission and polarization	Group Discussion, Lecture, seminar	
IV	ElectromagneticWaves					
	1	The wave equation for E and B – Monochromatic Plan waves – energy and momentum inelectromagnetic waves–	5	Understand the Wave equation, energy for E and B. Explain the electromagnetic waves in matter	PPT Illustration, Descriptive lecture.	Evaluation through quiz, Descriptive
	2	electromagnetic waves in matters -TE waves in rectangular waveguides – the co-axial transmission line	5	Explain in brief the reflection and transmission at normal incidence and oblique incidence	Lecture, Group discussion	answers short questions Assignment Formative assessment (II CIA)
	3	Potentials: potentials and fields – scalar and vectorpotentials – Gauge transformation – Coulomb Gauge and Lorentz Gauge – Lorentz force lawinpotentialform.	5	Understand the concept of Coulomb gauge and Lorentz gauge	Lecture, seminar	

V	Application ofElectromagneticWaves					
	1	Boundary conditions at the surface of discontinuity – Reflection and refraction of E.M wavesat the interface of non – Conducting media	4	Understand the concept of four vectors, Minkowski force	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Problem solving Formative assessment (II CIA)
	2	Kinematic and dynamic properties – Fresnel'sequation – Electric field vector 'E' parallel to the plane of incidence and perpendicular to theplane of incidence	4	To acquire knowledge on the Maxwell's equations in four vector form.	Descriptive lecture	
	3	Reflection and transmission co-efficients at the interface between twonon–Conductingmedia	4	To acquire knowledge on theLagrangianand Hamiltonian force equations	Descriptive lecture, Seminar, Assignment	
	4	Brewster'slawanddegreeofpolarization–Totalinternalreflection.	3	Understand the brewster's law and degree of polarization	Illustration, Descriptive lecture	

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply, An- Analyze; K-Knowledge

Course Instructor : Ms. S. Virgin Jeba

Semester: III
Course Name: Electronics
Course code: PP2031

Hours/Week	**Credits**	**Total Hours**	**Marks**
6	**5**	**90**	**100**

Learning Objectives

1. To impart in depth knowledge about Semiconductors, diodes, Transistors, Operational Amplifiers, Memories and converters etc
2. To provide knowledge in the basic structure and working concepts of electronic devices.
3. To acquire application skills involving digital integrated circuit.

Course Outcome

COs	**Upon completion of this course, students will be able to:**	**PSO addressed**	**CL**
CO 1	Understand the basic operation, and features related to diodes, transistor, op-amps, converter and interpret their applications	**PSO-1**	**U**

CO 2	Explain about the internal circuitry and logic behind semiconductor memory devices.	**PSO-2**	**U**
CO 3	Assess the working of diodes, transistor, op-amps and converters.	**PSO-3**	**E**
CO 4	Design various filter circuits.	**PSO-6**	**C**
CO 5	Interpret the Internal Architecture of memory devices	**PSO-4**	**An**

Modules

Total contact hours: 90 (Including lectures, assignment and tests)

Unit	Section	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/Evaluation
I	**SemiconductorDiodes**					
	1	Introduction to Semiconductor - Intrinsic Semiconductor - Extrinsic Semiconductor	**4**	Define the basis of Semiconductor	PPT, Illustration and theoretical derivation, Circuit designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment I
	2	P-type- N-Type - PN Junction diode –Crystal Diode	**4**	Apply various junction diodes and Crystal Diode	Derivation and group discussion, Circuit designing	
	3	Zener diode- LED – Varactor Diode -Tunnel diode	**4**	Derivation of current voltage relations	PPT, Illustration, Theoretical formulation Circuit designing	
	4	Photo diode - schottky diode – Impatt diode- Characteristics and Applications.	**3**	ApplyCharacteristics and Applications.	Derivation and group discussion Circuit designing	
II	**Transistor Biasing and opto Electronic Devices**					
	1	Thevenin's and Norton's theorems	**4**	Solve Thevenin's and Norton's theorems	PPT, Derivation discussion Circuit designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment I
	2	Transistor action- PNP-NPN transistors – Transistor biasing and stabilization	**4**	Define and derive equations	Derivation and group discussion problem solving Circuit designing	

	3	Need for biasing- DC load line- operating point- Bias stability-	**3**	Statement and proof of operating point	Illustration, Theoretical formulation Circuit designing	
	4	Two port Network - Hybrid model – h parameters –– JFET – UJT- SCR	**4**	Two port Network and its applications	Derivation and group discussion problem solving Circuit designing	
III	**Operational Amplifier Applications**					
	1	Operational Amplifier-CMRR-Slew rate - Instrumentation amplifier – V to I and I to V converter – Op-amp stages	**4**	Analyse Operational Amplifier	Derivation discussion Circuit designing	Evaluation Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment I/II
	2	Equivalent circuits - Sample and Hold circuits. Applications of Op-Amp: Inverting, Non-inverting Amplifiers-circuits	**3**	Define and derive Inverting ad Non-inverting Amplifiers	Illustration, Theoretical formulation Circuit designing	
	3	Adder-Subtractor-Differentiator-Integrator-Electronic analog Computation solving simultaneous and differential equation –. Schmitt Trigger – Triangular wave generator –Sine wave generator	**4**	Define and Derive Adder-Subtractor-Differentiator - Integrator	Derivation and group discussion, PPT Circuit designing	

	4	Active filters: Low, High and Band pass first and second order Butterworth filters – wide and narrow band reject filters.	**4**	Define, deriveand apply Active filters	PPT, Illustration, Theoretical formulation Circuit designing	
IV	**Semiconductor Memories**					
	1	Classification of memories and sequential memory – Static Shift Register and Dynamic Shift Register	**4**	Discuss different types ofmemories and sequential memory	Derivation discussion Circuit designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers
	2	ROM, PROM and EPROM principle and operation Read & Write memory - Static RAM, dynamic RAM, Content Addressable Memory	**3**	Define and derive principle and operation	Derivation and group discussion, PPT Circuit designing	Formative assessment II
	3	Content Addressable Memory - principle, block diagram and operation. Programmable Logic Array (PLA) - Operation, Internal Architecture	**4**	Define and Derive different types of Content Addressable Memory	Derivation and group discussion Circuit designing	
	4	Charge Couple Device (CCD) - Principle, Construction, Working and Data transfer mechanism.	**4**	Define , deriveand apply Charge Couple Device	Derivation and group discussion Circuit designing	
V	**A/D and D/A Converter**					

	1	Sampling theorem-Time division multiplexing – Quantization –	**3**	Analyse Fundamental Sampling theorem	Discussion PPT Circuit designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment II
	2	DAC- Weighted resistor method – Binary Ladder network – ADC – successive approximation,	**4**	Analyse classification DAC	Derivation and group discussion, PPT Circuit designing	
	3	ADC Dual slope and Counter method	**4**	Explain ADC Dual slope and Counter method	Derivation and group discussion Circuit designing	
	4	Voltage to Frequency conversion and Voltage to Time conversion .	**4**	Define, deriveand apply Voltage to Frequency conversion	Derivation and group discussion, PPT Circuit designing	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Staff-in charge: Ms.C.Nirmala Louis & Ms.Jenepha Mary

Semester III

Course Name : Condensed Matter Physics - II

Course code: PP2023

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To develop analytical thinking to understand the phenomenon that decide various properties of solids thereby equip students to pursue higher learningconfidently.

Course Outcome

CO	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	Understand the theory of dielectrics and analyze the dielectric properties of materials.	PSO - 1	An
CO - 2	Explain various types of magnetic phenomenon and their properties and applications.	PSO - 4	E

CO - 3	Elaborate the properties and applications of superconductors.	PSO - 4	C
CO - 4	Apply the obtained concepts to challenges in condensed matter physics	PSO - 6	Ap

Modules

Total contact hours: 90 (Including lectures, assignment and tests)

Unit	Section	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/Evaluation
I	**Theory of Dielectrics:**					
	1	Dipole moment - Polarization - The electric field of a dipole - Local electric field at an atom - Clausius - Mosottiequation - Dielectric constants and its measurements	**4**	To acquire knowledge on polarization and Dielectric constants	cture Discussion with PPT illustration	valuation through: Online quiz, lass test, Formative assessment I
	2	Polarizability - The Classical theory of electronic polarizability - Ionic polarizabilities - Orientational polarizabilities - The polarizability catastrophe	**4**	To be able to understand the ofelectronic polarizability - Ionic polarizabilities	cture discussion with illustration,Derivation and group discussion	
	3	Dipole orientation in solids - Dipole relaxation and dielectric losses - Debye Relaxation time - Relaxation in solids	**4**	To be able to find out the Debye Relaxation time	PPTIllustration	

	4	Complex dielectric constants and the loss angle - Frequency and temperature effects on Polarization - Dielectric breakdown and dielectric loss	**3**	To understand the different Dielectric breakdown and dielectric loss.	Derivation and group discussion	
II	**Theory of Ferroelectrics and Piezo Electrics**					
	1	Ferroelectric Crystals - Classifications of Ferroelectric crystals - Dipole theory offerroelectricity - Landau Theory of the phase transition	**4**	To be able to classify Ferroelectric crystals	Lecture discussion with illustration	Evaluation through: Online quiz, Short questions, Descriptive answers, Formative assessment I
	2	Second order Transition - First Order Transition - Ferroelectric Transition - One-Dimensional Model of the Soft Mode of Ferroelectric Transitions	**4**	To understand the difference between first order transition and second order transition	Derivation and group discussion problem solving Circuit designing	
	3	Antiferroelectricity - Ferroelectric domains - Ferroelectric domain wall motion - Piezoelectricity	**3**	To acquire knowledge on Piezoelectricityand Ferroelectric domain wall motion	LectureIllustration,	
	4	Phenomenological Approach to Piezoelectric Effects - Piezoelectric Parameters and Their Measurements -	**4**	To understand the concept of Piezoelectric Parameters and Their Measurements	Lecture Discussion	
		Piezoelectric Materials				
III	**Magnetic properties of Materials:**					

	1	Terms and definitions used in magnetism - Classification of magnetic materials - Atomic theory of magnetism - The quantum numbers	**4**	To have clear idea about Classification of magnetic materials	Illustration, discussion	Evaluation through: Online quiz, Short questions, Descriptive answers, Formative assessment I/II
	2	The origin of permanent magnetic moments - Langevin's classical theory of diamagnetism - Sources of paramagnetism - Langevin's classical theory of paramagnetism - Quantum theory of paramagnetism	**3**	To acquire knowledge ondiamagnetism and paramagnetism	Derivation and group discussion	
	3	Paramagnetism of freeelectrons - Ferromagnetism - The Weiss molecular field - Temperature dependence of Spontaneous magnetization	**4**	To understand the concept of Paramagnetism of freeelectrons and Spontaneous magnetization	Derivation and group discussion,PPT Illustration	
	4	The physical origin of Weiss Molecular field - Ferromagnetic domains - Domain theory - Antiferromagnetism - Ferrimagnetism - Structure ofFerrite	**4**	To be able to determine the Antiferromagnetismand Ferrimagnetism	Derivation And Lecture Illustration	
IV	**Superconductivity:**					

	1	Occurrence of super conductivity - Destruction of super conductivity by magnetic fields - Meissner Effect - Type I and Type II Super conductors	**4**	To know the principlesof super conductivity and Meissner Effect	Derivation and discussion	Evaluation through: Online quiz, short questions, Descriptive answers,

	2	Heat Capacity - Energy gap - Microwave and infrared properties - Isotope effect - Thermodynamics of the superconducting transition	**3**	To understand the differentMicrowave and infrared properties and Isotope effect	Derivation and PPT	Formative assessment II
	3	London equation - Coherence Length - BCS theory of superconductivity, BCS groundstate-Fluxquantizationin asuperconductionring	**4**	Define and Derive London equation,Coherence Length and BCS theory of superconductivity	Derivation and group discussion	
	4	Durationofpersistencecurrents- Single particle tunnelling - DC Josephson effect - AC Josephson effect - Macroscopic quantum interference - High temperature super conductors - Applications	**4**	To Explain theSingle particle tunnelling, DC and AC Josephson effect	Derivation andgroup discussion	
V	**Physics of Nanosolids:**					
	1	Definition of nanoscience and nanotechnology - Preparation of nanomaterials - Surface to volume ratio	**3**	To acquire knowledge onnanoscience and nanotechnology and Preparation of nanomaterials	Discussion And Illustration with PPT	Evaluation through: Open book test, short questions, Descriptive answers,
	2	Quantum confinement - Qualitative and Quantitative description - Density of states of nanostructures	**4**	To have clear idea aboutDensity of states of nanostructures	Derivation and group discussion	Formative assessment II

	3	Excitons in Nano semiconductors - Carbon in nanotechnology - Buckminsterfullerene - Carbon nanotubes	**4**	To be able to determine theBuckminsterfullerene and Carbon nanotubes	Lecture Illustration	
	4	Nano diamond - BN nano tubes - Nanoelectronics - Single electron transistor - Molecular machine - Nanobiometrics	**4**	To acquire knowledge on Single electron transistor and Nanobiometrics	Lecture discussion with illustration	

PO- Program outcome; LO – Learning outcome; Cognitive Level R – Remember; U – Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

Course instructors: Dr. A. Lesly Fathima and Dr. (Sr). S. Sebastiammal

SEMESTER III

Course Name: MICROPROCESSORS AND MICROCONTROLLER

Course Code: PP2034

Hours/Week	**Credits**	**Total Hours**	**Marks**
6	**4**	**90**	**100**

Learning Objectives

1. To provide an extensive knowledge about the architecture and assembly language programming of microprocessors 8085 & 8086 and microcontroller 8051.
2. To gain hands on experience in interfacing of 8085 microprocessor.

Course Outcome

COs	**Upon completion of this course, students will be able to**	**PSOs addressed**	**CL**
CO-1	Identify/ Explain the operation of various components of the microprocessor 8085 and microprocessor 8086	**PSO-1**	**A**
CO-2	Relate and explain the various addressing modes and the instruction set of 8085 microprocessor	**PSO-1**	**R**
CO-3	Develop skill in writing simple programs for 8085 microprocessor	**PSO-2**	**C**
CO-4	Explain the architecture of 8051 microcontroller	**PSO-1**	**U**
CO-5	Understand the various interrupts of 8085 microprocessor	**PSO-2**	**U**

Modules

Credits:4 **Total contact hours: 90 (Including assignments and tests)**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Microprocessors 8085 Architecture**					
	1	Intel 8085 microprocessor : Introduction – Pin configuration- Architecture and its operations	4	To understand the principle of microprocessor, architecture and its operation	Lecture Discussion with PPT illustration	Evaluation through: shorttest Class Test Multiple choice questions Quiz Formative assessment I
	2	Machine cycles of 8085- Interfacing of memory and I/O devices	4	To understand the concept of machine cycles and interfacing	Lecture discussion	
	3	Instruction classification: number of bytes, nature of operations-	4	To know the classification of instructions according to their byte size and its nature of operation	Lecture discussion	
	4	Instruction format- Vectored and non-vectored interrupts	3	To distinguish between vectored and non-vectored interrupts	Lecture discussion	

II	**8085 Assembly Language Programming**					
	1	Instruction set: Data transfer operations - Arithmetic operations	4	To understand the use of data transfer and arithmetic instructions	Lecture Illustration PPT	Evaluation through:

	2	Logical operations- Branching and machine control operations -	4	To categorize the logical, branching and machine control operations and know its use while writing assembly language program	Lecture discussion PPT	Short test Quiz Assignment Formative assessment Class test Open book test
	3	Addressing modes Writing assembly language programs: Looping, counting and indexing	4	To be able to know the different addressing modes to access data	Lecture Illustration PPT	
	4	Stack – subroutine- Translation from assembly language to machine language	3	To understand about stack and subroutine	PPT Descriptive Lecture	
III	**Microprocessor 8086**					
	1	Intel 8086 microprocessor: Introduction – Architecture - Pin configuration	**4**	To understand the architecture and pin configuratio n of 8086	Lecture with PPT Illustration	Evaluation through: Class test Quiz Multiple choice questions Formative assessment II
	2	Operating modes: Minimum mode, Maximum mode.	3	To understand the different operating modes of 8086	Question-answer session Lecture	
	3	Memory addressing: 8-bit data from even and odd address bank, 16-bit data from even and odd address bank- Addressing modes	4	To acquire knowledge on memory addressing and addressing modes	Lecture with PPT Illustration	

	4	Interrupts: Hardware interrupts – Software interrupts –Interrupt priorities- Simple programs.	4	To understand the concept of interrupts and difference between hardware and software interrupts	Lecture PPT	
IV	**Microcontroller 8051 Architecture and Programming**					
	1	Introduction to microcontroller and embedded system- Difference between microprocessor and microcontroller	3	To acquire knowledge on microcontroller and the difference between microprocessor or microcontroller	Lecture Discussion PPT	Evaluation through: Class test Quiz Short test Formative assessment II
	2	8051 microcontroller: Pin configuration, Architecture and Key features. 8051 Data types and directives	4	To understand the pin configuration, architecture	Lecture Discussion PPT	
	3	Instruction set: Data transfer instructions - Arithmetic instructions – Logical instructions-	4	To be able to understand the data transfer, arithmetic and logical instructions to write assembly language program		
	4	Branching instructions- Single bit instructions. Addressing modes- Simple programs using 8051 instruction set.	4	To know the addressing modes of 8051 and simple programmes using instruction set		
	Interfacing of Microprocessor 8085					

	1	Basic concepts of programmable device - 8255 Programmable Peripheral Interface (PPI)	5	To have practical knowledge on angle of friction and cone of friction	Lecture with PPT	Evaluation through: Short test Class test Open book test Quiz Assignment Formative assessment III
	2	interface of ADC and DAC-8257 Direct Memory Access (DMA) controller	5	To understand the concept rectangular and triangular lamina.	Lecture Illustration	
	3	Basic concepts of serial I/O and data communication – interface of 8251 Universal Synchronous Asynchronous Receiver Transmitter (USART)	5	To be able to understand the basic concepts of serial input and output and data communicatio n	Lecture with PPT Illustrat ion	